

We claim:

903/13  
1. A method for determining crystallization conditions for a material, the method comprising:  
taking a plurality of different crystallization samples in an enclosed microvolume, the plurality of crystallization samples comprising a material to be crystallized and crystallization conditions which vary among the plurality of crystallization samples;  
allowing crystals of the material to form in plurality of crystallization samples; and  
identifying which of the plurality of crystallization samples form crystals

2. The method according to claim 1 wherein the material to be crystallized is a macromolecule.

3. The method according to claim 1 wherein the material to be crystallized is a protein.

4. The method according to claim 1 wherein the material to be crystallized is a macromolecule with a molecular weight of at least 500 daltons.

5. A method according to claim 1 wherein the material to be crystallized is selected from the group consisting of viruses, proteins, peptides, nucleosides, nucleotides, ribonucleic acids, deoxyribonucleic acids.

503/62  
~~6. A method according to claim 1 wherein the material to be crystallized is selected from the group consisting of viruses, proteins, peptides, nucleosides, nucleotides, ribonucleic acids, deoxyribonucleic acids.~~

2  
7. A method according to claim 1 wherein the enclosed microvolume is a lumen.

1 <sup>3</sup>~~8~~. A method according to claim 1 wherein the enclosed microvolume is a  
2 lumen with a cross sectional diameter of less than 2.5 mm.

1 <sup>4</sup>~~9~~. A method according to claim 1 wherein the enclosed microvolume is a  
2 lumen with a cross sectional diameter of less than 1 mm.

1 <sup>5</sup>~~10~~. A method according to claim 1 wherein the enclosed microvolume is a  
2 lumen with a cross sectional diameter of less than 500 microns.

1 <sup>6</sup>~~11~~. A method according to claim 1 wherein the enclosed microvolume is a  
2 microchamber.

1 <sup>7</sup>~~12~~. A method according to claim 1 wherein the enclosed microvolume is at  
2 least partially enclosed within a substrate which comprises other enclosed  
3 microvolumes which also comprise crystallization samples.

1 <sup>8</sup>~~13~~. A method according to claim 1 wherein the enclosed microvolume is at  
2 least partially enclosed within a card shaped substrate.

1 ~~14.~~ A method according to claim 1, the method further comprising performing  
2 a spectroscopic analysis on a crystal formed within a microvolume within the  
3 microvolume.

1 15. A method according to claim 14, wherein the spectroscopic analysis is  
2 selected from the group consisting of Raman, UV/VIS, IR or x-ray spectroscopy.

1 <sup>9</sup>~~16~~. A method according to claim <sup>9</sup>~~14~~, wherein the spectroscopic analysis is x-  
2 ray spectroscopy.

1 ~~17.~~ A method according to claim 1, wherein the microvolume is enclosed  
2 within a material defining the microvolume such that in a volume of the  
3 microvolume and the material defining the microvolume that an x-ray beam used  
4 for x-ray spectroscopy of a crystal will traverse in the process of performing x-ray  
5 spectroscopy on a crystal within the microvolume, the volume of the microvolume

TEB090-504280

6 contains at least as many electrons as the sum of the electrons contained in the  
7 volume of the material defining the microvolume that the x-ray beam will traverse.

1 18. A method according to claim 1, wherein the microvolume is enclosed  
2 within a material defining the microvolume such that in a volume of the  
3 microvolume and the material defining the microvolume that an x-ray beam used  
4 for x-ray spectroscopy of a crystal will traverse in the process of performing x-ray  
5 spectroscopy on a crystal within the microvolume, the volume of the microvolume  
6 contains at least three times as many electrons as the sum of the electrons  
7 contained in the volume of the material defining the microvolume that the x-ray  
8 beam will traverse.

1 19. A method according to claim 1, wherein the microvolume is enclosed  
2 within a material defining the microvolume such that in a volume of the  
3 microvolume and the material defining the microvolume that an x-ray beam used  
4 for x-ray spectroscopy of a crystal will traverse in the process of performing x-ray  
5 spectroscopy on a crystal within the microvolume, the volume of the microvolume  
6 contains at least five times as many electrons as the sum of the electrons contained  
7 in the volume of the material defining the microvolume that the x-ray beam will  
8 traverse.

1 20. A method according to claim 1, wherein the microvolume is enclosed  
2 within a material defining the microvolume such that in a volume of the  
3 microvolume and the material defining the microvolume that an x-ray beam used  
4 for x-ray spectroscopy of a crystal will traverse in the process of performing x-ray  
5 spectroscopy on a crystal within the microvolume, the volume of the microvolume  
6 contains at least ten times as many electrons as the sum of the electrons contained  
7 in the volume of the material defining the microvolume that the x-ray beam will  
8 traverse.

1 21. A method according to claim 1, wherein material defining the microvolume  
2 comprises a groove designed to reduce a number of electrons that an x-ray beam  
3 used for x-ray spectroscopy of a crystal will traverse in the process of performing  
4 x-ray spectroscopy on a crystal within the microvolume.

1 22. A method according to claim 1, wherein the method further comprises  
2 delivering the plurality of different crystallization samples to the enclosed  
3 microvolume.

17

1 ~~23.~~ A method according to claim 1, wherein the method further comprises  
2 forming the plurality of different crystallization samples within the enclosed  
3 microvolume.

1 24. A method according to claim 1, wherein one or more dividers is positioned  
2 between the crystallization samples to separate the crystallization samples within  
3 the enclosed microvolume.

1 25. A method according to claim 1, wherein the divider is formed of an  
2 impermeable material.

1 26. A method according to claim 25, wherein the impermeable material is an  
2 impermeable liquid.

1 27. A method according to claim 25, wherein the impermeable material is an  
2 impermeable solid.

1 28. A method according to claim 25, wherein the divider is formed of a  
2 permeable material.

1 29. A method according to claim 25, wherein the divider is formed of a  
2 semipermeable material.

1 ~~30.~~ A method according to claim ~~29~~<sup>24</sup>, wherein the semipermeable material is a  
2 gas.

1 ~~31.~~ A method according to claim ~~29~~<sup>23</sup>, wherein the semipermeable material is a  
2 liquid.

1 <sup>26</sup> 32. A method according to claim <sup>23</sup> 28, wherein the semipermeable material is a  
2 gel.

1 33. A method according to claim 25, wherein the divider forms an interface  
2 selected from the group consisting of liquid/liquid, liquid/ gas interface, liquid/  
3 solid and liquid/ sol-gel interface.

1 34. A method according to claim 25, wherein the divider is selected from the  
2 group consisting of a membrane, gel, frit, and matrix

1 35. A method according to claim 25, wherein the divider functions to modulate  
2 diffusion characteristics between adjacent crystallization samples.

1 36. A method according to claim 25, wherein the divider is formed of a  
2 semipermeable material which allows diffusion between adjacent crystallization  
3 samples.

1 37. A method for determining crystallization conditions for a material, the  
2 method comprising:  
3 taking a plurality of different crystallization samples in a plurality of  
4 enclosed microvolumes, each microvolume comprising one or more crystallization  
5 samples, the crystallization samples comprising a material to be crystallized and  
6 crystallization conditions which vary among the plurality of crystallization  
7 samples;  
8 allowing crystals of the material to form in plurality of crystallization  
9 samples; and  
10 identifying which of the plurality of crystallization samples form crystals.